BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
YELAHANKA – BANGALORE – 64
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

A

Report on

Faculty development Programme

Title: Recent Advances in Renewable Energy Technologies

Date: 22nd January to 27th January 2018

Day 1:

The programme was started by lighting the lamp by our distinguished dignitaries. The programme was presided by Dr. Annamma Abraham, Vice Principal, BMSIT&M. Chief guest and key note address speaker was Dr. Sudhir Kumar, Joint Director, and CPRI. Conveners of the programme were Dr. Rama Rao, HoD Dept of EEE and Dr. Jagadish Vengala, HoD of Dept. of Civil Engg. There were about a total of 50 participants.

Session 1:

Speaker: Dr. Sudhir Kumar, Joint Director, CPRI

Lighting the lamp by Chief Guest

Lighting the lamp by Vice Principal

Key note address by Mr. Sudhir Kumar

Participant is lighting the lamp

During his session Dr. Sudhir Kumar shared several technological and legal aspects of aspects related to renewable energy technologies.

Dr. Kumar explained legal aspects of grounding problems in renewable energy technology. He also explained harmful effects of LED light such as eye fatigue, effect on human skin etc.

He also said that while testing solar inverters IEC 61683 and 60068 standards are followed. He mentioned that solar pumping systems are currently available in the capacity of up to 20HP.

Later in the session Mr. Kumar explained basic terminologies of solar module. He explained about the difference of KW and KWp of a solar panel. He posed several questions to the participants to keep the session interactive and lively. Mr. Kumar discussed about panel efficiency of various PV modules. He also told that in countries like Germany building integrated PV modules are used. A typical solar panel produces 5 units per day. He threw an open question to the participants on impact of surplus solar power on power system.

At the end of the session he explained about usage of solar power in drying, sterilization, solar distillation, solar cooking, solar vaccination etc.

Session 2:

Speaker: Mr. Shaik Mohammed Rafi, managing Partner, Envirosytems.

Participants during the session

Mr.Shaik Mohammed is being felicitated by Dr. Sanjay

Mr. Shaik delivered the talk on waste management. He started the session by explaining the different types of wastes. Waste management or waste disposal is all the activities and actions required to manage waste from its inception to its final disposal.This includes amongst other

things collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling.

Waste can take any form that is either solid, liquid, or gas and each have different methods of disposal and management. Waste management normally deals with all types of waste whether it was created in forms that are industrial, biological, household, and special cases where it may pose a threat to human health. It is produced due to human activity such as when factories extract and process raw materials. Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics.

Mr. Shaik revealed that a large portion of waste management practices deal with municipal solid waste (MSW) which is waste that is created by household, industrial, and commercial activity.

Energy recovery from waste is the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolyzation, anaerobic digestion, and landfill gas recovery. This process is often called waste-to-energy. Energy recovery from waste is part of the non-hazardous waste management hierarchy. Using energy recovery to convert non-recyclable waste materials into electricity and heat, generates a renewable energy source and can reduce carbon emissions by offsetting the need for energy from fossil sources as well as reduce methane generation from landfills. Globally, waste-to-energy accounts for 16% of waste management.

Mr. Shaik also explained the pyrolysis process. Pyrolysis is often used to convert many types of domestic and industrial residues into a recovered fuel. Different types of waste input (such as plant waste, food waste, tyres) placed in the pyrolysis process potentially yield a recovered energy source that can be an alternative to fossil fuels. Pyrolysis is a process of thermo-chemical decomposition of organic materials by heat in the absence of oxygen which produces various hydrocarbon gases. During pyrolysis, the molecules of object are subjected to very high temperatures leading to very high vibrations. Therefore, every molecule in the object is stretched

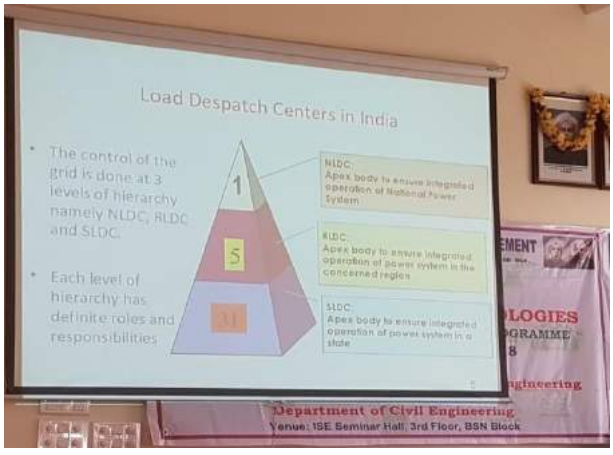
and shaken to an extent that molecules starts breaking down. The rate of pyrolysis increases with temperature. In industrial applications, temperatures are above 430 °C (800 °F). Fast pyrolysis produces liquid fuel for feedstocks like wood. Slow pyrolysis produces gases and solid charcoal.[23] Pyrolysis hold promise for conversion of waste biomass into useful liquid fuel. Pyrolysis of waste plastics can produce millions of liters of fuel. Solid products of this process contain metals, glass, sand and pyrolysis coke which cannot be converted to gas in the process.Compared to the process of incineration, certain types of pyrolysis processes prevent the release of harmful product residues that contain some alkali metals, sulphur, and chlorine. Pyrolysis results in smaller contaminant gas emissions which make for smaller clean-up methods that would reduce cost. Some concerns to point out are that pyrolysis yields gasses which impact the environment such as HCl and SO2.

Day 2:

Session 1:

Speaker: Mr. M.N.Murthy, Ex Principal Director, PSTI, Bangalore

Mr. MN Murthy delivering the session



Presentation under progress

Mr. Murthy discussed about several issues of power system. A gist of Mr. Murthy's talk is provided here.

All India Installed Capacity (MW) Sector wise as on 30.11.2017 is

Sector	Thermal				Nuclear	Hydro	RES	Grand Total
	Coal	Gas	Diesel	Total				
State	63780.50	7078.95	363.93	71223.38	0.00	29858.00	1976.90	103058.27
Private	74496.00	10580.60	473.70	85550.30	0.00	3394.00	58180.76	147125.06
Central	54695.00	7490.83	0.00	62185.83	6780.00	11711.42	0.01	80677.25
All India	192971.50	25150.38	837.63	218959.51	6780.00	44963.42	60157.66	330860.58

The sage of Renewable energy source is about 18.8%.

He told the audience about the evolution Indian Grids. Earlier 5 different grids had five different frequencies. From Jan 2014 onwards we have One India- One Grid concept.

The control of Grid is done at 3 different levels. Namely,

1. NLDC: National Load Dispatch Centre, Apex body to ensure integrated operation of national power system.

2. RLDC: Regional Load Dispatch Centre, Apex body to ensure integrated operation of the concerned region.

3. SLDC: State Load Dispatch Centre, Apex body to ensure integrated operation of a power system in a state.

He also explained about Electricity act 2003.

As far as RES sector is concerned following are the Achievements and Targets of Renewable Energy in India

Sector	Cumulative Achievements in MW 31.11.16	Cum Target on Mar 2017	Cum Target as on Mar 2022
Wind Power	28419	32352	60000
Solar Power	8875	10941	100000
Small Hydro Power	4325	5495	5000
Bio-Power (Biomass & Gasification and Bagasse Cogeneration)	4932	6125	10000
Waste to Power	114	150	-
Total	46666	55064	175000

Day 2:

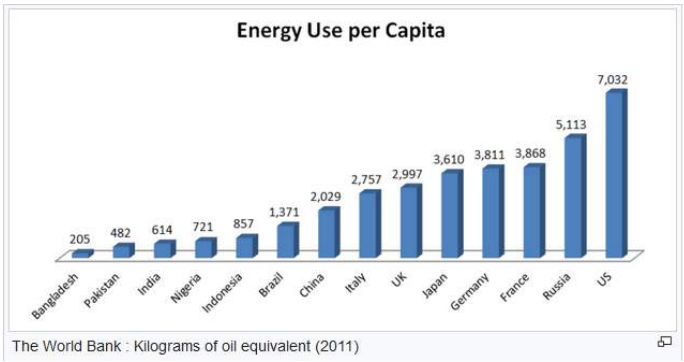
Session 2: Dr. Sanjay Laxminarayanan, Professor, Dept. of EEE

Dr. NDN Prasad, Physics HoD presenting memento to Dr. Laxmi Narayanan

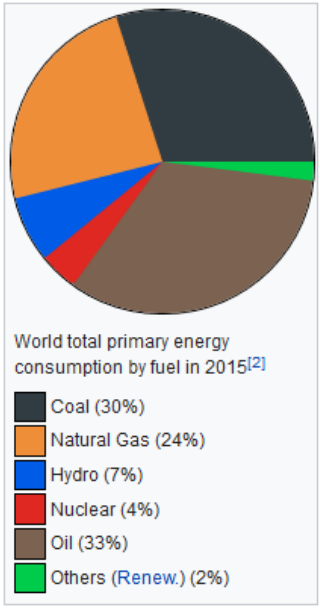
Dr. Sanjay started the session by giving a very good definition to renewable energy sources, that is "Renewable"= Can be "renewed".

Renewable energy source is one that can be renewed within the life time of human civilization unlike non-renewable sources like fossil fuels which took millions of years to form and will get depleted if mined indiscriminately.

He revealed fact that US stands at the top as far as energy use per capita is concerned. The following bar chart explains the scenario.



Sir also explained the energy consumption using a pie chart.



He also mentioned that as per the auctions conducted on December 21, 2017 wind energy is now the cheapest source of renewable energy (Rs. 2.43 per unit).

As per David Pimentel's study finds that producing ethanol and bio diesel from corn and other crops is not worth the energy.

In the US wind power is more popular than solar. Out of all the renewable energy produced in the US in 2015, 19% came from wind and only 6% came from solar.

Sir also compared Roof top solar power generation with Diesel power generation. Solar roof top power is currently available in the bracket of Rs 6 – 7.7 per unit. Whereas diseal power generating cost is about Rs. 16/KWh.

Day2:

Session 3: Dr. M.C. Madhu, Assistant Professor, Dept of Mech Engg, BMSIT & M

Dr. Madhu delivered this session on solar power. He mentioned that solar energy is the ultimate Renewable Resource. He explained the basic definition of solar energy that is it originates from thermo nuclear reaction in the sun. It represents entire electromagnetic radiation.

He stated the following advantages and disadvantages of solar energy,

Advantages

- All chemical and radioactive polluting byproducts of the thermonuclear reactions remain behind on the sun, while only pure radiant energy reaches the Earth.
- Energy reaching the earth is incredible. By one calculation, 30 days of sunshine striking the Earth has the energy equivalent of the total of all the planet's fossil fuels, both used and unused!

Disadvantages

- Solar radiation is intermittent.
- Solar energy is a largely scattered source. To harness this energy, we must convert it into a form which we can use, such as heat, light and electricity.

He also mentioned several applications of solar energy such as, Solar Thermal, Solar Photovoltaic etc.

He summarized the session with the following thoughts.

- Argument that sun provides power only during the day is countered by the fact that 70% of energy demand is during daytime hours. At night, traditional methods can be used to generate the electricity.
- Goal is to decrease our dependence on fossil fuels.
- Currently, 75% of our electrical power is generated by coal-burning and nuclear power plants.
- Mitigates the effects of acid rain, carbon dioxide, and other impacts of burning coal and counters risks associated with nuclear energy.
- Pollution free, indefinitely sustainable.

Day 3:

Industrial Visit: Mahatma Gandhi Institute of Rural Energy & Development

Session 1: Mrs. SaraKunnath, Senior faculty, MGIRED

Solar rooftop PV explanation

Musium visit

Solar PV panel with built in cleaning assembly

Wind mill at MGIRED

Mrs. Sara started session by explain the objectives of MGIRED. This instate was started in the year 200 with an objective to provide renewable energy solutions to the society. The institute actively participates in the following fields,

Training program: Awareness creation, skill development etc.

Extension activities: energy assessment of organizations.

Consultancy: providing consultancy services in rooftop solar PV, bio gad, wind energy etc.

Research: Renewable energy, environment, bio-diversity, Rural

Mrs. Sara also revealed the fact that 20KW rooftop solar PV system can generate up to80 units/day and 2400 units / annum. She also mentioned that, conventional 1 phase induction motor fans (100W) can be replace by energy efficient BLDC motor based super fans (65W). Using which we can save upto 1.26 units day.

Session 2: Mrs. Shanthi G, Deputy Director (SOLAR), MGIRED

Mrs. Shanthi G discussed about various facts related to power generation. She mentioned that in India the current coal availability is 60.6 billion tones. Also in thermal power plants we can't use Indian coal, because indigenous coal is consisting of low Calorific Value.

She also mentioned that, the Thungbadhra dam head capacity is reduced due to the silt problem. This silt cannot be removed due to that fact that, cleaning cost of silt removal would match the construction cost of a new dam. Therefore the trend is moving towards mini hydal power plants.

Day 5:

Session1: Dr. Jagadish Vengala, HoD Civil Engg, BMSIT&M

Dr. Vengala delivered a talk on energy efficient building technologies. During his session he explained about Smart city indicators. A typical smart city structure should be consisting of Economy model, governance model, waste management, transportation and urban planning.

Smart city may be defined as, a term denoting the effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive of future for citizens.

Later on in the session Dr. Vengala discussed about basic strategies in smart cities. These involve the following,

Core urban infrastructure, development of area based replicable model and ICT enabled solutions to core infrastructure.

At the end of the session Dr. Vengala talked about green building concepts. Green building may be defined as one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste, and provides healthier space for occupants compared to conventional building, designed constructed and operated to minimize total environmental aspects.

Session 2: Dr. Ravi D.R, Karnataka State Pollution Control Board

Dr. Ravi started the session by explaining the methodology of test methods for testing Reduction of Hazardous Substances (ROHS) Parameters.

E-waste generated by producer for a specific EEE category code is to be estimated on the basis of quantity (number or weight) of EEE placed in the market in the previous years and taking into consideration the average life of the equipment. Such estimate should be carried out using the following method; the generation of e-waste from end of life products: E-waste generation (weight or number) in the financial year 'x – y' = Sales in the financial year '(x-z) - (y-z)' where, 'x – y' = financial year in which generation is estimated, and z= average life span of EEE.

At the middle of the session he mentioned about e waste management rules. Here he mainly stressed on responsibilities of manufacturer and producer.

Responsibilities of the manufacturer:- (1) collect e-waste generated during the manufacture of any electrical and electronic equipment and channelize it for recycling or disposal; (2) apply for an authorization in Form 1 (a) in accordance with the procedure prescribed under sub-rule (2) of rule 13 from the concerned State Pollution Control Board, which shall give the authorization in accordance with Form 1 (bb); (3) ensure that no damage is caused to the environment during

storage and transportation of e-waste; (4) maintain records of the e-waste generated, handled and disposed in Form-2 and make such records available for scrutiny by the concerned State Pollution Control Board; (5) file annual returns in Form-3, to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates.

Responsibilities of the producer: - The producer of electrical and electronic equipment listed in Schedule I shall be responsible for - (1) implementing the Extended Producers Responsibility with the following frameworks, namely:- (a) collection and channelization of e-waste generated from the 'end-of-life' of their products or 'end-of-life' products with same electrical and electronic equipment code and historical waste available on the date from which these rules come into force as per Schedule I in line with the targets prescribed in Schedule III in Extended Producer Responsibility - Authorization; (b) the mechanism used for channelization of e-waste from 'end-of-life' products including those from their service centers to authorized dismantler or recycler shall be in accordance with the Extended Producer Responsibility - Authorization. In cases of fluorescent and other mercury containing lamps, where recyclers are not available, channelization may be from collection center to Treatment, Storage and Disposal Facility; (c) for disposal in Treatment, Storage and Disposal Facility, a pre-treatment is necessary to immobilize the mercury and reduce the volume of waste to be disposed off; (d) Extended Producer Responsibility - Authorization should comprise of general scheme for collection of waste Electrical and Electronic Equipment from the Electrical and Electronic Equipment placed on the market earlier, such as through dealer, collection centers, Producer Responsibility Organization, through buy-back arrangement, exchange scheme, Deposit Refund System, etc. whether directly or through any authorized agency and channelizing the items so collected to authorized recyclers.

Session 3: Dr. Balaraman Kannan, Director, National Institute of wind energy.

Dr. Balaraman Kannan, started the session by explains the wind mill construction. Here he mainly concentrated on the classification of wind mills, i.e. vertical axis and horizontal axis turbines.

He also explained the usage of gear box in a wind generator.

In the session he also mentioned that, to have a very good wind flow, there has to be a constant change in temperature. Sir told the audience that, the permanent magnets used in wind generator can retain magnetism for almost 25 years.

Dr. Kannan explained the concept of active power and reactive power concept with the help of vector diagram. He revealed various interesting facts about wind power generation that is happening in India.

The FDP concluded by proposing vote of thanks by Mr. Vikram Chekuri. Certificates were distributed to all faculty members.